HDR Video Technology Part 2-2

Application Guide Post Production

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Contents

High Dynamic Range Video Technology Part 2-2:

Application Guide Post Production

1 Scope

This document specifies HDR Vivid standard post production process, relevant software and hardware requirements and process test standards.

This document is applicable to HDR Vivid post production of video materials in the fields of television broadcasting, digital movies, network television, network video, etc.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version is applicable to this document. For undated references, the latest version (including all modified versions) is applicable to this document.

T/UWA 005.1-2022 High Dynamic Range (HDR) Video Technology Part 1: Metadata and Adaptation

T/UWA 005.2-1-2022 High Dynamic Range (HDR) Video Technology Part 2-1: Application Guide and System Integration

3 Terms and definitions

3.1 Finished product files

After the adjustment of HDR Vivid dynamic metadata, the video file containing HDR Vivid dynamic metadata is encoded and outputted.

3.2 Production workstation

It refers to the workstation integrating HDR Vivid post production function on the basis of conventional video production capability.

4 Abbreviations

Abbreviations specified in T/UWA 005.1-2022 and T/UWA 005.2-1-2022 are applicable to this document.

5 Post production process

5.1 Summary

HDR Vivid post production is carried out after the completion of conventional HDR production. Based on the video files or timeline projects which have been color corrected after the conventional HDR production, HDR Vivid post production further generate the dynamic metadata for specific brightness display terminals, and finally outputs the released version files with HDR Vivid information.
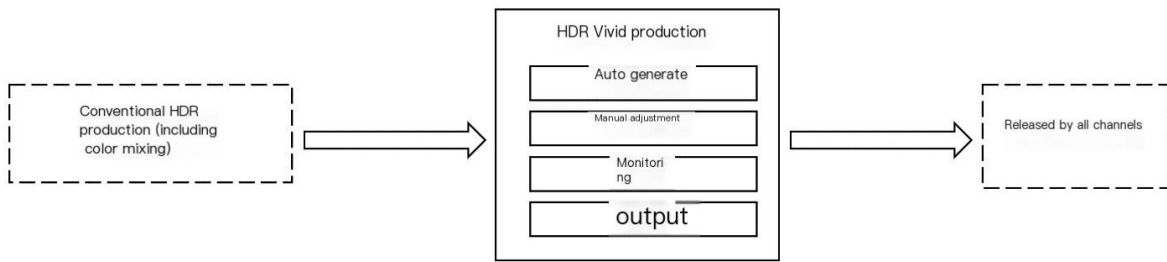
Figure 1 **HDR Vivid post production system block diagram**

The post production process of HDR Vivid standard is divided into 6 steps:

(1) Import program file;

(2) Automatically generate metadata;

(3) Effect monitoring;

(4) Manual adjustment;

(5) Output finished product files;

(6) Generate release versions of different specifications.
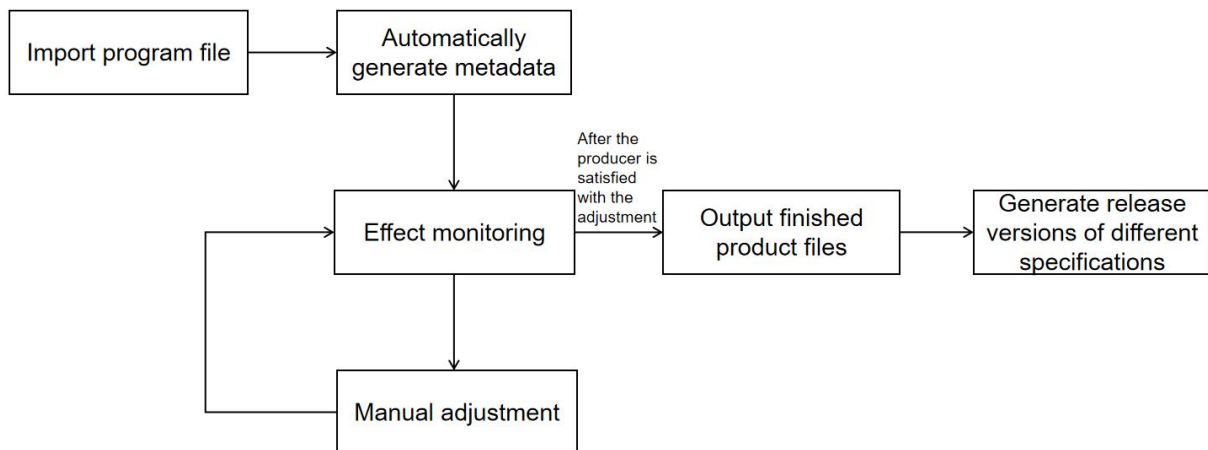
Figure 2 **Detailed flow chart of HDR Vivid post production**

5.2 **Import program file**

The basic specifications for importing video files or timeline project files produced by conventional HDR production are: BT.2020 color gamut, color depth of at least 10bit, and ST 2084/HLG format standard.

5.3 **Automatically generate metadata**

Through the HDR Vivid dynamic metadata automatic generation function of the production workstation, producers analyze the source video frame by frame   automatically generate HDR Vivid dynamic metadata for each frame, and complete the shot (scene) segmentation of the source video. The production workstation needs to integrate the dynamic metadata automatic generation algorithm. (e. g specified in appendix A of T/UWA 005.1-2022.)

5.4 **Effect monitoring**

In the production and monitoring environment of HDR Vivid, the producer uses the target brightness monitor, or sets the monitor to the target brightness, and uses the production workstation to play or locate a specific location of the video in real time to monitor the HDR Vivid effect.

5.5 Manual adjustment

For those scenes and lenses with unsatisfactory effects, producer manually adjust the HDR Vivid curve of the selected lens (scene) according to the monitoring feedback (as shown in Figure 3, the abscissa is the brightness value of the original material, and the ordinate is the brightness value of the HDR Vivid mapping).

The producer, through the relevant control interface of the production workstation, adjusts the parameter values of dark area offset, dark detail, dark brightness, medium gray brightness, bright area offset, bright area brightness, bright area detail, highlight, overall saturation, and brightness saturation of the selected lens (scene) for positive and negative offset. The production workstation will modify the HDR Vivid dynamic metadata in real time according to the adjusted offset value, and draw HDR Vivid curves on the interface, At the same time, the effect changes are output to the monitor in real time. See 12.3.2 in T/UWA 005.2-1-2022 for specific technical description.
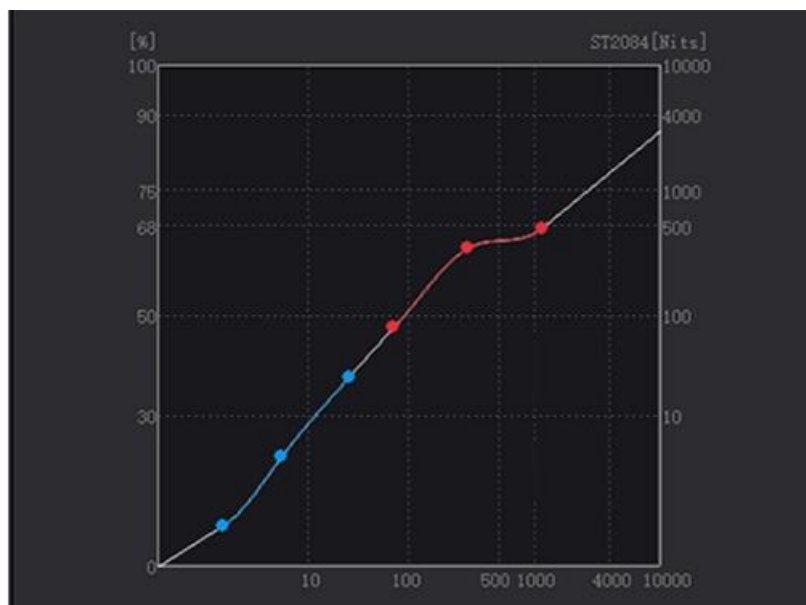
Figure 3 **HDR Vivid curve**

5.6 Output finished product files

After the producer is satisfied with the adjustment of HDR Vivid dynamic metadata, he(she) continues to operate the production workstation to embed HDR Vivid dynamic metadata into the source video data, and encode and output the finished product file. It is suggested that the generated finished product file should have a high bit rate version (to ensure that it can cover the release needs of various bit rate versions that may exist in the future).

5.7 Generate release versions of different specifications

In the future, if there is a need for multi bit rate release, the finished product file with appropriate bit rate can be transcoded and packaged into video files of different specifications for release. In the process of generating

release versions of different specifications, relevant tools should maintain the original brightness, color gamut and HDR Vivid dynamic metadata.

6 General requirements for post production environment construction

6.1 Summary

In order to meet the post production requirements of HDR Vivid, the post production environment should at least include production workstations and monitors, and meet professional physical environment requirements.

6.2 Physical environment requirements

The basic requirements for HDR Vivid post production physical environment are as follows:
(1) Post production shall be carried out in the standard production environment (5cd/m2 ambient light) specified in BT.2020 as far as possible;
(2) The working environment of the monitor shall meet the requirements of 18% gray darkroom, and provide D65 light source with color rendering performance of more than 90%.

6.3 Production workstation requirements

The basic capability requirements of HDR Vivid production workstation are as follows:
(1) It has basic ultra-high definition editing capability, at least supports the encoding and decoding, playback, accurate frame positioning, monitor output functions of 4K materials in mainstream formats, supports the BT.2020 color gamut, and supports ST 2084/HLG features;
(2) Support frame by frame analysis of video data and automatic generation of HDR Vivid dynamic metadata;
(3) Support real-time output of the video with HDR Vivid dynamic metadata in monitoring, and draw HDR Vivid curve on relevant software interface;
(4) Support the offset adjustment of parameter values such as dark area offset, dark area detail, dark area brightness, medium gray brightness, bright area offset, bright area brightness, bright area detail, highlight, overall saturation, brightness saturation in the software interface, and output real-time monitoring;
(5) Support encoding output of finished product files containing HDR Vivid dynamic metadata, and subsequent generation of release versions with different bit rates based on finished product files. The format of the output video file supports 4K, and the bit depth is not less than 10bit.
(6) It has HDR Vivid post-processing capability and can support monitors without dynamic metadata processing capability to monitor HDR Vivid effects.

6.4 Monitor Requirements

Monitor the video output from the production workstation with a monitor. The basic requirements of the monitor are as follows:
(1) Support ST 2084/HLG;
(2) The contrast ratio of the brightest white and the darkest is 200000:1, and the peak brightness is 10000nits;
(3) Grayscale Avg DE2000<2 in HDR mode of monitor;
(4) The color gamut range shall completely cover DCI-P3, and at least 90% of BT.2020 color space shall be covered in BT.2020 mode;
(5) The monitor shall be calibrated at least once a year to ensure that the above requirements are met for a long time.
(Refer to Section 11.2 and 11.3 of T/UWA 005.2-1-2022 for monitor requirements other than Section 6.4)

7 Post production process validation criteria

7.1   Detection equipment working status

（1）Power supply conditions

The equipment during post production process verification shall be at rated voltage, and the change of power supply voltage during verification shall not exceed ±2%; When AC power grid is used for power supply, the fluctuation of power frequency shall not exceed ±2%, and the harmonic component shall not exceed ±5%.

（2）Stabilization time

Before the validation of the post production process, the relevant equipment will be warmed up for 30min in the factory state after startup to ensure stable equipment performance.

7.2   Post production environment adjustment

Before post production process verification, the production workstation cannot import video files in advance; Ambient light shall meet 5cd/m2 specified in BT.2020 or adaptive (screen brightness and color temperature shall be automatically adjusted according to the brightness of viewing environment); Monitor calibration can use HDR color bar signal specified in ITU-R BT.2111 to calibrate the brightness and color of the monitor; Other state preparations required for HDR production are also needed.

7.3   Verify post production process

（1）Import material:

The color depth of the material format used for process verification shall be at least 10bit, BT.2020 color gamut, and the ST 2084/HLG format standard shall be adopted. It supports viewing the format of imported materials, including but not limited to format, bit depth, frame rate, bit rate, etc.

（2）Automatically generate metadata:

After importing materials, dynamic metadata is automatically generated.

（3）HDR Vivid video effect monitoring:

Preview the picture effect of real-time conversion according to HDR Vivid dynamic metadata on the monitor.

（4）Manual adjustment:

In the process of image monitoring, it is supported to open the HDR Vivid manual adjustment panel. During manual adjustment, it is supported to check the brightness of the target monitor, HDR Vivid curve, and manually adjust those parameters such as dark zone offset, dark detail, dark brightness, medium gray brightness, bright zone offset, bright zone brightness, bright zone detail, highlight, overall saturation, brightness saturation, etc. Observe whether the effect of parameter adjustment will be reflected on the HDR Vivid curve on the software interface in real time, and monitor the effect of real-time adjustment through the monitor.

#### （5）Output finished products and multiple bit rate release files:

After the above verification steps are completed, the finished product can be output and the file can be released. The generated file conforms to the HDR Vivid specification and can be correctly played in the HDR Vivid standard playback device according to the expected effect.

Appendix A HDR Vivid production using Sobey EditMax series production workstation

HDR Vivid production using Sobey EditMax series nonlinear editing software (no less than V11.5) mainly involves four steps, and the specific process test requirements are as follows:

（1）**Establish PQ domain timeline.**
Create a timeline on the operation interface of Sobey EditMax software shown in Figure A.1, and import ST 2084/HLG video materials for HDR Vivid production. If the imported file has been produced by conventional HDR production (including static metadata), the recommended format is as follows: Apple Prores MOV, DNxHR MXF, XAVC MXF or HEVC MP4.
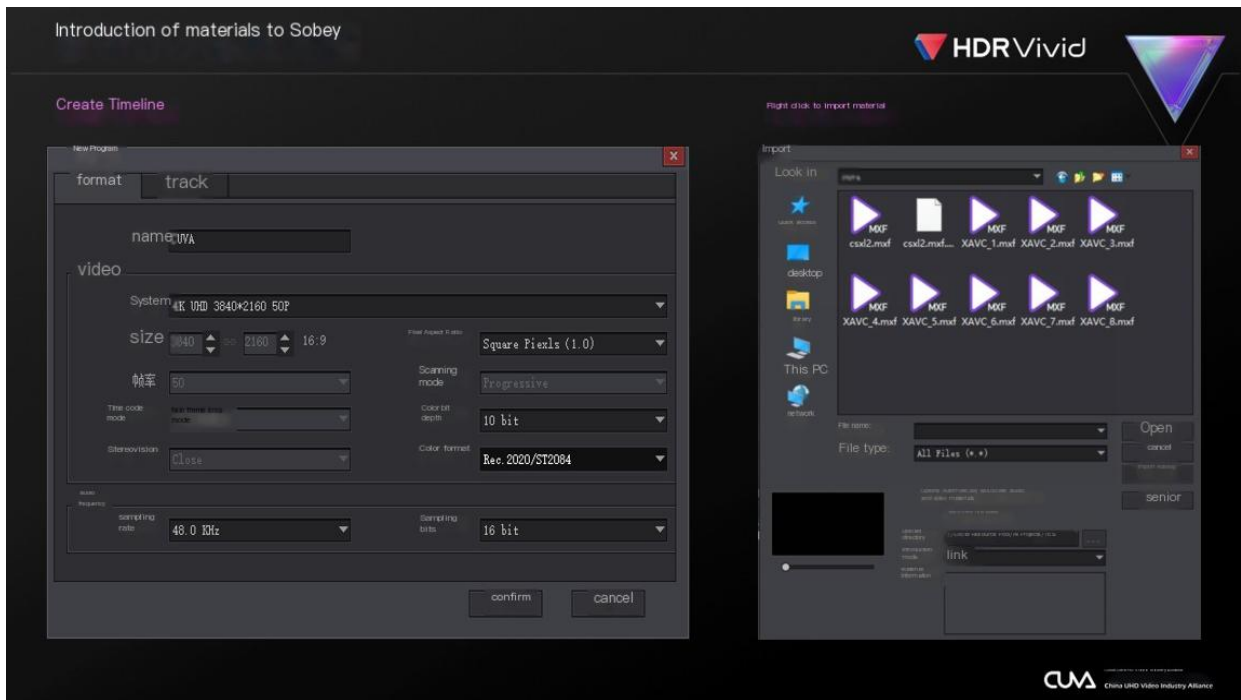
Figure A.1 **EditMax Timeline Creation and Material Introduction**

If the video material is a color correction finished program, go directly to the next step; If there is a need for conventional HDR production, you can also use the color correction function of EditMax (as shown in the interface in Figure A.2) , and then go to the next step.

Figure A.2 **EditMax workstation color mixing interface**

6

（2）**Automatically generate master files for HDR Vivid metadata**

After selecting the program timeline in the EditMax nonlinear editing software, the F11 shortcut key pops up the interface as shown in Figure A.3. After setting the key parameters at the corresponding position of the interface, the video material with HDR Vivid dynamic metadata will be automatically generated (before the automatic generation of metadata, the video scene will be segmented first. Generally speaking, one shot corresponds to one scene, and then metadata will be generated for each frame), The metadata standard meets the parameter standard specified in T/UWA 005.1-2022, and a new master file with dynamic metadata will be generated.

Master file is a concept defined by Sobey, the entity is a video file embedded with dynamic metadata. The purpose is that when only one version of the release file is generated, the process mentioned in chapter 5.6 can quickly output the finished file based on the master file. The master file should increase the bit rate (try to maintain the image quality, such as 200M) and shorten the GOP (faster editing response, such as 25).
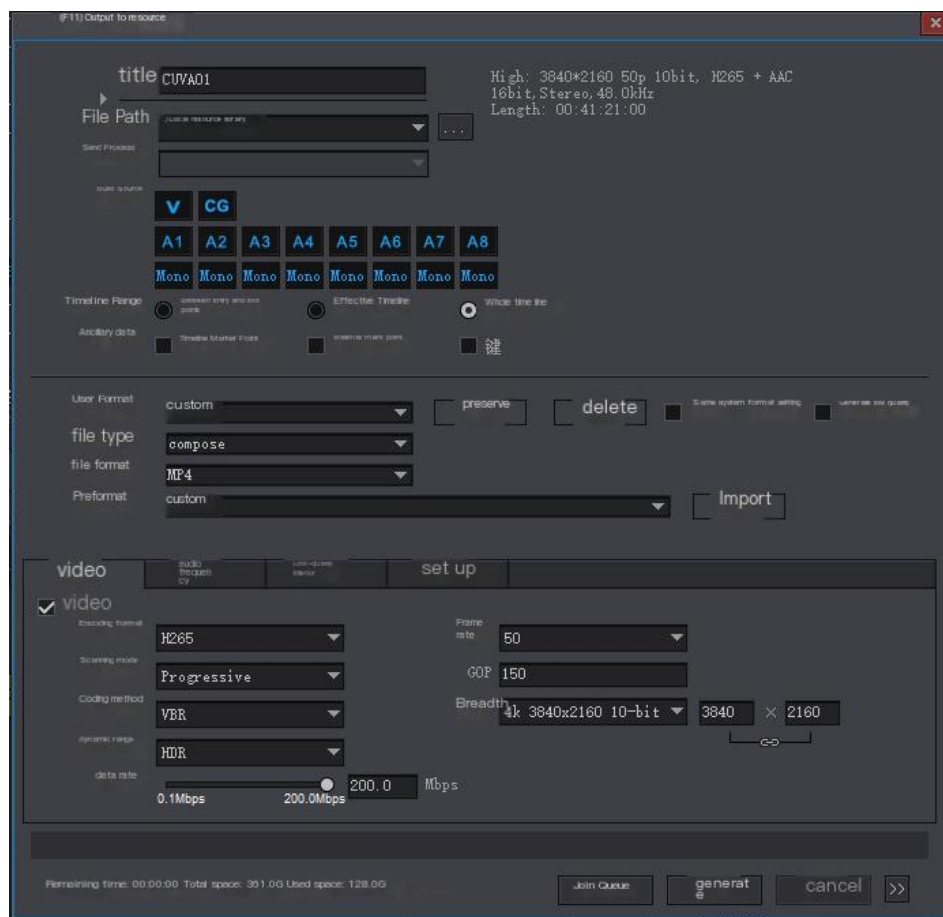

Figure A.3 **Automatically Generating Master Files with Metadata**

（3）**Monitoring and manual adjustment**

Drag the master file onto the timeline again to play and monitor the effect on the monitor.

If adjustment is needed, the producer can right click the material and select "HDR Vivid Dynamic Metadata Adjustment" from the pop-up menu shown in Figure A.4. Then, in the pop-up operation interface as shown in Figure A.5, according to the monitoring feedback, the producer can adjust the contrast, saturation and other characteristic details of the dark part/middle tone/bright part of the picture, and EditMax will reflect the adjustment results in real time in the HDR Vivid curve on the left side of the interface, and in the timeline

playback window and monitor on the upper side of the interface. And EditMax further generate dynamic metadata with a specific algorithm (in order to avoid excessively frequent frame by frame adjustment, currently the adjustment of a single frame on EditMax will affect the whole scene (shot), and the scene segmentation of video has been automatically completed by the algorithm in the step of automatically metadata generating).
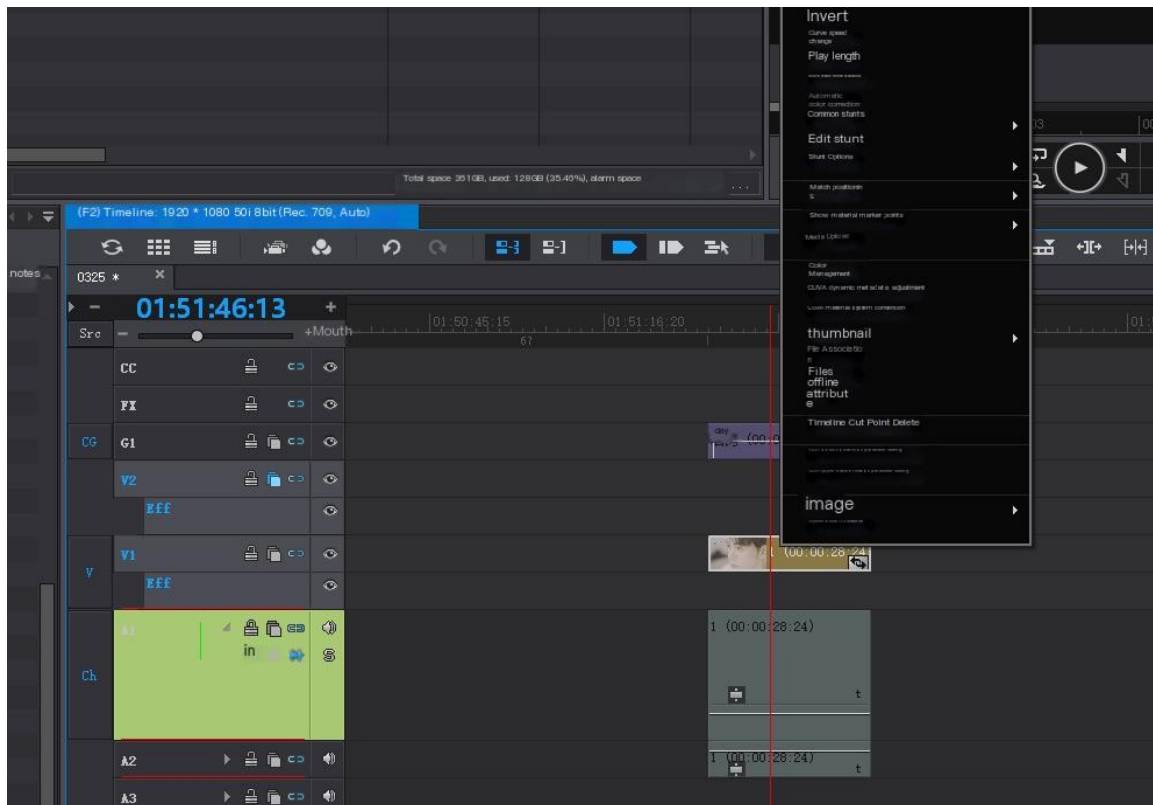

Figure A.4 **Right click the timeline master material and select "HDR Vivid Dynamic Metadata Adjustment**

Figure A.5 **HDR Vivid Adjustment Interface**

After adjustment, click "Update File" to update the modified dynamic metadata to the master file. The master file can be copied and directly encoded into the final output finished product file.

（4）**Generate other bit rate publishing files with HDR Vivid dynamic metadata**

If other bit rate publishing files are needed, producer can right click the material and select "HDR Vivid Material Standard Conversion". In the pop-up window shown in Figure A.6, select the required parameters to generate a publishing file that contains HDR Vivid dynamic metadata and meets the aforementioned publishing file specification standards.
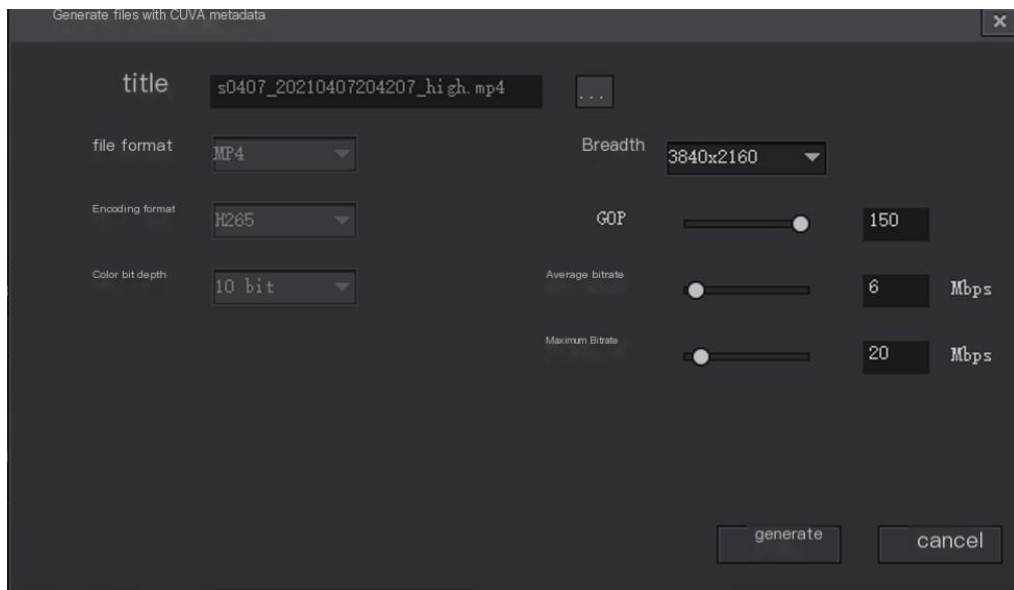
Figure A.6 **Generating Release Files of Various Specifications**

Appendix B Configuration description of Sobey HDR Vivid post production system

Table B.1 **Sobey Editmax11.5 HDR Vivid 4K Workstation Entry Level Configuration**

CPU	Intel Xeon 6226R 2.9GHz (16 core) × 2
Memory	8GB DDR4-2933 ECC memory × 12 (96GB in total)
System disk	480 GB SATA Enterprise SSD Solid State Drive × 1
Data disk	Internal data disk: 2TB 7200 rpm SATA hard disk × 1 Optional: 4TB 7200 rpm SATA hard disk Optional: 6TB 7200 rpm SATA hard disk Optional: 8TB 7200 rpm SATA hard disk Number of optional disks：1~3
Graphics card	NVIDIA Geforce RTX 2080，video memory 8GB
Display	Support 2560 * 1440，27 inch widescreen LCD display × 2 (double screen)
Audio monitoring	Stereo headset or speaker If you need 5.1/7.1 monitoring, you need to choose one of the following two devices: 1. 5.1/7.1 channel headset with external audio USB sound engine 2. Sound card supporting 5.1/7.1 channel output and corresponding number of speaker units 7.1 Channel output sound card optional: RME Fireface 802 Stereo output sound card optional: Focusrite 18i8 (with audio playback)
Operating system	Windows 10 Pro for Workstations 64bit
I/O card	1) UHD/HD/SD compatible broadcast level digital I/O card (3G-SDI × 4) 2) Blackmagic DeckLink 4K Extreme 12G (12G-SDI) 3) Blackmagic DeckLink 8K Pro (12G-SDI × 4)
Power supply	1125W

Table B.2 **Recommended Configuration of Sobey Editmax11.5 HDR Vivid 4K Workstation**

CPU	Intel Xeon 6226R 2.9GHz (16 core) × 2
Memory	8GB DDR4-2933 ECC memory × 24 (192GB in total)
System disk	480 GB SATA Enterprise SSD Solid State Drive × 1
Data disk	Internal data disk: 2TB 7200 rpm SATA hard disk × 1 Optional: 4TB 7200 rpm SATA hard disk Optional: 6TB 7200 rpm SATA hard disk Optional: 8TB 7200 rpm SATA hard disk Number of optional disks：1~3
Graphics card	NVIDIA Geforce RTX 3070，video memory 11GB
Display	Support 2560 * 1440 27，inch widescreen LCD display × 2 (double screen)
Audio monitoring	Stereo headset or speaker If you need 5.1/7.1 monitoring, you need to choose one of the following

	two devices:
	1. 5.1/7.1 channel headset with external audio USB sound engine
	2. Sound card supporting 5.1/7.1 channel output and corresponding number of speaker units
	7.1 Channel output sound card optional: RME Fireface 802
	Stereo output sound card optional: Focusrite 18i8 (with audio playback)
Operating system	Windows 10 Pro for Workstations 64bit
I/O card	1) UHD/HD/SD compatible broadcast level digital I/O card (3G-SDI × 4)
	2) Blackmagic DeckLink 4K Extreme 12G (12G-SDI)
	3) Blackmagic DeckLink 8K Pro (12G-SDI × 4)
Power supply	1125W

Table B.3 **Recommended Configuration of Sobey Editmax11.5 HDR Vivid 8K Workstation**

CPU	Intel Xeon 6258R 2.7GHz (56 cores) × 2
Memory	8GB DDR4-2933 ECC memory × 24 (384GB in total)
System disk	480 GB SATA Enterprise SSD Solid State Drive × 1
Data disk	Internal data disk: 2TB 7200 rpm SATA hard disk × 1
	Optional: 4TB 7200 rpm SATA hard disk
	Optional: 6TB 7200 rpm SATA hard disk
	Optional: 8TB 7200 rpm SATA hard disk
	Number of optional disks: 1~3
Graphics card	NVIDIA Geforce RTX 3070 video memory 11GB × 2
Display	Support 2560 * 1440, 27 inch widescreen LCD display × 2 (double screen)
Audio monitoring	Stereo headset or speaker
	If you need 5.1/7.1 monitoring, you need to choose one of the following two devices:
	1. 5.1/7.1 channel headset with external audio USB sound engine
	2. Sound card supporting 5.1/7.1 channel output and corresponding number of speaker units
	7.1 Channel output sound card optional: RME Fireface 802
	Stereo output sound card optional: Focusrite 18i8 (with audio playback)
Operating system	Windows 10 Pro for Workstations 64bit
I/O card	1) UHD/HD/SD compatible broadcast level digital I/O card (3G-SDI × 4)
	2) Blackmagic DeckLink 4K Extreme 12G (12G-SDI)
	3) Blackmagic DeckLink 8K Pro (12G-SDI × 4)
Power Supply	1400 W

References

[1] T/UWA 005.3-2-2022 High Dynamic Range (HDR) Video Technology Part 3-2: Technical Requirements and Test Methods Portable Display Equipment

[2] T/UWA 005.3-3-2022 High Dynamic Range (HDR) Video Technology Part 3-3: Technical Requirements and Test Methods Broadcasting Equipment

[3] T/UWA 005.3-4-2022 High Dynamic Range (HDR) Video Technology Part 3-4: Technical Requirements and Test Methods Playback Software

[4] UWA-RZWJ-101 Management Measures for UWA Certification Test

[5] UWA-RZWJ-HDR-302 Rules for Use of UWA Certification Certificate and Certification Mark

[6] UWA-RZWJ-HDR-303 Specification for Use of HDR Vivid Visual Recognition

[7] RTBF [2020] No. 126, Implementation Guide for 4K Ultra HD TV Program Production Technology, Department of Science and Technology, State Administration of Radio and Television